Pan Am Railways

2019 Wetland Report

Iron Horse Park Superfund Site: AOC 3

Billerica, Massachusetts

26 December 2019

Project No.: 0476110

The business of sustainability

ERM

Document details	The details entered below are automatically shown on the cover and the main page footer. PLEASE NOTE: This table must NOT be removed from this document.
Document title	2019 Wetland Report
Document subtitle	Iron Horse Park Superfund Site: AOC 3
Project No.	0476110
Date	26 December 2019
Version	1.0
Author	ERM Consulting & Engineering, Inc.
Client Name	Pan Am Railways

Signature Page

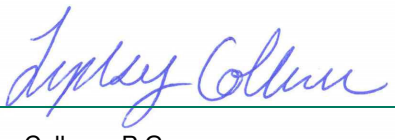
26 December 2019

2019 Wetland Report

Iron Horse Park Superfund Site: AOC 3

Billerica, Massachusetts

Stacey Harvey, P.E.
Principal Consultant



Lyndsey Colburn, P.G.
Partner in Charge

ERM Consulting & Engineering, Inc.

One Beacon Street, 5th Floor
Boston, Massachusetts
02108

CONTENTS

List of Tables

Acronyms and Abbreviations

Name	Description
AOC	Area of Concern
ERM	ERM Consulting & Engineering, Inc.
FAC	facultative
OBL	obligate
Pan Am	Pan Am Railways
PEM	Palustrine emergent
Plan	Wetland Restoration and Creation Plan
Site	Iron Horse Superfund Site
SWCA	SWCA Environmental Consultants

1. INTRODUCTION

On behalf of Pan Am Railways (Pan Am), ERM Consulting & Engineering, Inc. (ERM) has prepared this Wetland Monitoring Report for the Iron Horse Superfund Site (Site) Area of Concern (AOC) 3. This report was prepared in accordance with the *Wetland Restoration and Creation Plan* (Plan) and documents the results of field investigations, observations, and actions taken during calendar year 2019 (Year 1).

The Site is in North Billerica, Massachusetts and is part of a 553-acre industrial complex that dates back to 1913 (USEPA 2018). The Site consists of rail yard facilities, landfills, and wastewater lagoons. AOC 3 is approximately 4 acres on the southwest portion of the Site. AOC 3 contains two former Boston and Maine locomotive shop disposal areas (AOC 3A and 3B) (USEPA 2018). The area is bordered by railroad tracks (owned by Boston and Maine) to the north and west. There are a large parking lot and a FedEx package facility to the south, and an upland forested area to the east. A National Grid overhead power line traverses the northern, eastern, and western boundaries.

Remediation at AOC 3 included capping the landfill and restoring the wetlands. Pan Am completed remediation activities, including wetland restoration and planting, in June 2019.

The newly restored wetlands at the Site are required to be monitored during Years 1, 2, and 3 and then again during Years 5, 7, and 10. Section 5 of the Plan outlines the requirements for long-term monitoring; success standards are summarized in Table 1. This reports documents 2019 (Year 1) wetland monitoring field investigations and results.

2. WETLAND CONSTRUCTION AND PERFORMANCE CRITERIA

Pan Am restored approximately 41,500 square feet of wetlands at AOC 3. Following final grading, native trees, shrubs, and emergent herbaceous vegetation were planted in specified locations to favor the development of palustrine emergent (PEM), scrub shrub (PSS), and palustrine forested wetlands (PFO) (Appendix A, Figure 2).

The Plan established five performance goals to evaluate the wetland restoration and creation (Table 1). Table 2 outlines the wetland monitoring schedule for the Site.

Table 1: Wetland Mitigation Performance Goals

Category	Performance Goal
Vegetation Coverage: Areal coverage of non-invasive wetland plant species	75% cover within two full growing seasons (except deepwater marsh PEM wetlands in AOC 1)
Vegetation Richness: Number of volunteer native wetland species added per year	2 species added in Years 2, 3 and 5 of post-construction monitoring
Hydrology Indicators[a]	Evidence of one primary indicator or two secondary indicators of hydrology in three of the first five years post-construction during the growing season
Tree Height: Increase in height of woody species each year with milestone goals	The average height of all woody stems of tree species including volunteers in each sampling plot, must increase by not less than an average of 10% per year by the fifth (Year 5 following construction) and tenth (Year 10 following construction) monitoring years. Trees shall be at least 5 feet or taller in total height after 10 years.
Survivability: Number of planted woody species that survive	80% of each of the approved planted woody species healthy and surviving in Year 5 of post-construction monitoring

[a] Primary and secondary indicators used will be from the list in the most recent Regional Supplement to the Corps of Engineers Wetland Delineation Manual (USACE 2012).

Table 2: Wetland Mitigation Area Inspection and Monitoring Schedule

Year	Spring Inspection	Summer Inspection	Aerial Vegetation Coverage	Vegetation Richness	Hydrology Indicators	Tree Height	Woody Vegetation Survivability	Soil Evaluation	Agency Report
2019 (Year 1)	Final Restoration	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
2020 (Year 2)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
2021 (Year 3)	Yes	Yes	No *(If goal is met)*	Yes	Yes	Yes	Yes	Yes	Yes
2022 (Year 4)	No	No	No	No	No	No	No	No	No
2023 (Year 5)	Yes	Yes	No *(If goal is met)*	Yes	Yes	Yes	Yes	Yes	Yes
2024 (Year 6)	No	No	No	No *(If goal is met)*	No	No	No	No	No
2025 (Year 7)	Yes	Yes	No *(If goal is met)*	No *(If goal is met)*	No *(If goal is met)*	Yes	No *(If goal is met)*	No	Yes
2026 (Year 8)	No	No	No	No	No	No	No	No	No
2027 (Year 9)	No	No	No	No	No	No	No	No	No
2028 (Year 10)	Yes	Yes	No *(If goal is met)*	No *(If goal is met)*	No *(If goal is met)*	Yes	No *(If goal is met)*	No	Yes

3. WETLAND MONITORING METHOLDOLGY AND RESULTS

As described in Section 5 of the Plan, wetland areas must be inspected at least two times during the growing season in Years 1, 2, 3, 5, 7, and 10 (ERM 2012). The spring of 2019 (Year 1), involved planting activities and final restoration, as well as periodic, general inspections through June/July 2019 to ensure establishment of plantings. ERM conducted the late summer monitoring on 6 and 7 September 2019. Monitoring activities included setting up the vegetation plots, analyzing vegetation coverage, surveying the wetland mitigation area to create an ongoing list of species present, and measuring tree height and survivability within the vegetation plots. Additional activities included photographing the Site from established photo stations, and identifying the location and density of invasive species.

3.1 Areal Vegetation Coverage

ERM set up four long-term representative plots within the wetland mitigation area of AOC 3. Each plot was marked with a permanent center stake. Due to the elongated shape of the mitigated wetland area, dimensions of each plot were modified to remain within the designated wetland type (Table 3). All plots maintained an equivalent area to the 15-foot and 30-foot plot radiuses in accordance with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (USACE 2012).

ERM scientists will revisit these plots annually in accordance with the Plan. Two of these plots (2A and 2D) are in the restored PEM wetland, plot 2B is in the PSS wetland, and plot 2C is in the PFO wetland. The Site was heavily vegetated. However, during the 2019 monitoring year, plots 2A, 2B, and 2C did not achieve the goal of 75 percent areal coverage. This was due to high levels of non-native species within the plot, including a dominance of barnyard grass (*Echinochloa crus-galli)*. ERM expects that this species will die back after the first growing season. The 75 percent goal was met at plot 2D. In this plot, the water surface was entirely colonized by common duckweed (*Lemna minor*).

Table 3: Areal Vegetation Coverage

Wetland Mitigation Area	Vegetation Monitoring Station	Trees (%)	Shrubs/ Saplings(%)	Herbs (%)	Vines (%)	Absolute Cover (%)	Goal Met
PEM	2A	0	1	93	0	94	No
PSS	2B	0	4	94	0	98	No
PFO	2C	0	8	94	0	94	No
PEM	2D	1	0	100	0	101	Yes

PEM = palustrine emergent; PFO = palustrine forested; PSS = scrub shrub

3.2 Vegetation Richness

Vegetation richness refers to the number of facultative (FAC), facultative-wet, or obligate (OBL) species in the wetland. Volunteer species are those that were not planted or seeded, but colonized the area as part of natural revegetation. The Site meets the performance goal if at least two new wetland plant species are observed in the wetlands in monitoring Years 2, 3 and 5.

In 2019, ERM scientists conducted meander surveys within the wetland mitigation area to create a baseline list of FAC, facultative-wet, or OBL species (USACE 2012). ERM identified 21 species (Table 4). Of the 21 species listed, 13 were volunteer.

Table 4: Comprehensive List of Vegetative Species Observed in the Wetland Areas of AOC 3 (Year 1-Baseline)

Scientific Name	Common Name	Wetland Indicator Status[a]	Origin
Acer negundo	Boxelder	FAC	Planted
Acer rubrum	Red maple	FAC	Planted
Alnus incana	Speckled alder	FACW	Planted
Bidens frondosa	Devil's beggar-ticks	FACW	Volunteer
Bidens cernua	Nodding beggar-ticks	OBL	Volunteer
Cyperus esculentus	Yellow nutsedge	FACW	Volunteer
Echinochloa crus-galli	Large barnyard grass	FAC	Volunteer
Eleocharis obtusa	Blunt spikesedge	OBL	Volunteer
Glyceria striata	Fowl manna grass	OBL	Volunteer
Ipomoea hederacea	Ivy-leaved morning-glory	FAC	Volunteer
Juncus effusus	Common softrush	OBL	Planted
Lemna minor	Common duckweed	OBL	Volunteer
Lythrum salicaria	Purple loosestrife[b]	OBL	Volunteer
Panicum	Panic grass	FACW	Volunteer
Persicaria lapathifolia	Dock-leaf smartweed	FACW	Volunteer
Phragmites australis	Common reed[b]	FACW	Volunteer
Pontederia cordata	Pickerelweed	OBL	Planted
Salix nigra	Black willow	OBL	Planted
Sambucus nigra	Black elderberry	FACW	Planted
Schoenoplectus tabernaemontani	Softstem bulrush	OBL	Volunteer
Setaria pumila	Yellow bristle grass	FAC	Volunteer

[a] State of Massachusetts 2016 Wetland Plant List (USACE 2016)

[b] Listed as an invasive plant species by the Massachusetts Invasive Plant Advisory Group (Massachusetts Invasive Plant Advisory Group 2005)

FAC = facultative; FACW = facultative-wet; OBL = obligate

3.3 Hydrology Indicators

Indicators of hydrology provide visual evidence of soil saturation and inundation necessary to support a functioning wetland. Each of the four wetland areas were investigated for the potential presence of primary or secondary hydrological indicators as defined in the Supplement (USACE 2012). All plots during the 2019 monitoring event contained primary indicator A1, surface water. This indicator requires observation of flooding or ponding in the area (Supplement; USACE 2012). ERM observed the deepest surface water in plot 2B and measured depths of up to 6 inches. Standing water in all plots contained floating algae mats as well as dense colonies of common duckweed. In portions of the plots that contained no surface water, ERM observed a second primary indicator, A3 soil saturation. Soil at the

surface was very wet and was observed to glisten in sunlight. On the Site perimeter near plot 2D, ERM observed indicator B9, water stained leaves.

3.4 Survivability and Tree Height

Survivability refers to the number of planted woody species that survive. As described in the Plan, the survivability performance goal requires that at least 80 percent of the approved planted woody species survive at Year 5 of post-construction monitoring. To determine survivability, the Plan requires ERM to count the number of native planted woody species and volunteer woody species in the long-term monitoring plots. In addition, the Plan also requires the total tree height be measured during the first, fifth, seventh, and tenth years of monitoring within the established permanent sampling plot. The average height of all woody stems of tree species must increase at least 10 percent annually by the fifth (Year 5 following construction) and tenth (Year 10 following construction) monitoring years.

In each of the long term monitoring plots, ERM located and counted planted trees and shrubs. Plantings were located in plot 2A, plot 2B and plot 2C. Plot 2D was in the PEM wetland and did not contain any planted trees or shrubs. Out of 36 trees observed in the long term monitoring plots, 78 percent (28) were determined to have survived (table 5).

Table 5: Survivability and Heights of Native Woody Species within the Long-Term Monitoring Plots

Scientific Name	Common Name	Wetland	Design	Number Located	Survivability	Average Height (Inches)
Plot 2A						
Alnus incana	Speckled alder	FACW	Planted	5	100%	36.4
Plot 2B						
Alnus incana	Speckled alder	FACW	Planted	6	33%	29.5
Sambucus nigra	Black elderberry	FACW	Planted	4	75%	20.6
Viburnum dentatum	Arrowwood	FAC	Planted	1	0%	n/a
Plot 2C						
Acer rubrum	Red maple	FAC	Planted	3	100%	32
Acer negundo	Boxelder	FAC	Planted	11	91%	47.7
Unknown	Unknown	Unknown	Unknown	1	0%	n/a
Salix nigra	Black willow	OBL	Planted	5	100%	40.8
			Overall	**36**	**78%[a]**	**38.6[a]**

[a] *Weighted Average*

FAC = facultative; FACW = facultative-wet; OBL = obligate

n/a not applicable

3.5 Photographic Stations

During the 2019 late summer monitoring event, ERM set up seven photo stations around the perimeter of the wetland restoration area (Appendix A, Figure 2). Each year during the required Site visit, ERM will revisit each of the stations and take photographs in the same direction. This will provide a visual depiction

of the Site conditions on an annual basis. The 2019 summer photographic log for each of the seven photo stations is included in Appendix B.

3.6 Invasive Species

As described in the Plan, the risk of colonization of invasive species is high, particularly purple loosestrife (*Lythrum salicaria*) and *phragmites* (*phragmites australis*; also called common reed). In the surrounding areas of the Site, east of photo station 6, ERM observed large concentrations of *phragmites*. A berm on the outer edge of the wetland appeared to function as a barrier, reducing the spread of *phragmites* into the restored wetland. Around the eastern edge of the Site, scattered patches of *phragmites* were observed. ERM did not observe *phragmites* in other areas of the restored wetland. Bordering the riprap along the southern portion of the Site, isolated stems of purple loosestrife (less than 10 individuals) were observed. In addition, one stem of purple loosestrife was observed in plot 2B, but composed less than 1 percent of the herbaceous stratum. ERM identified one stem of black locust (*Robinia pseudoacacia*) in plot 2B.

3.7 Corrective Actions/Adaptive Management

To control the extent of invasive species, ERM supervised herbicide treatments/applications. SWCA Environmental Consultants (SWCA) performed one application on 6 September 2019. Two SWCA technicians, equipped with backpack sprayers, spot treated the invasive species observed on the Site. In total, SWCA applied 8 gallons of mixed herbicide containing glyphosate, non-ionic surfactant, and marking dye. To prevent invasive species from outcompeting native species. ERM recommends an application in late summer 2020 (Year 2).

4. CONCLUSION

ERM conducted Year 1 Site monitoring in 2019 at AOC 3. Monitoring will continue in 2020 (Year 2). As indicated in Table 2 and the Plan, wetland areas will be inspected at least twice during the growing season in Years 2, 3, 5, 7, and 10.

4.1 Vegetation Coverage

The performance goal for vegetation coverage requires 75 percent areal coverage of non-native wetland plant species at the Site within two full growing seasons (year 2020 for AOC 3). Although the Site was well-vegetated and the soil was stabilized, three of the plots have not met the 75 percent goal due to the dominance of non-native barnyard grass. Barnyard grass is an annual plant (USDA, NRCS 2019), and ERM anticipates that the dominance of this species will decline as other plant species become established. Monitoring of areal coverage will continue in monitoring Year 2.

4.2 Vegetation Richness

ERM created a baseline list of plants that included 21 total species that had a wetland indicator status of FAC or wetter. In total, 14 species were volunteer, including six wetland OBL species. If normal conditions are maintained within the Site, ERM expects that this performance goal will be met in the subsequent monitoring years as required by the Plan.

4.3 Hydrology

The hydrology indicators performance goal requires the presence of at least one primary or two secondary indicators of hydrology within the mitigation areas in at least three of the first 5 years

post-construction. ERM observed primary indicators of hydrology within all four wetland monitoring plots during the late summer monitoring periods. As a result, hydrology indicators only need to be documented during two more growing seasons (between 2020 and 2024). If normal conditions continue at the Site, ERM expects that suitable hydrology will be maintained and the hydrology performance goal will be met.

4.4 Tree Heights

During the 2019 Site visit, ERM measured each tree observed in the wetland monitoring plots as a baseline. The performance goal requires the wood stems of tree species to increase by not less than 10 percent per year by the fifth year (2023) and tenth year (2028).

4.5 Woody Plant Survivability

In 2019, the overall planted tree/shrub survivability was determined to be 78 percent. This is two percent below the 80 percent goal required by the Plan. This goal has to be reached by Year 5 (2023). ERM will monitor the plants in spring 2020 to determine if any regrowth has occurred on the trees or shrubs not considered to have survived.

5. REFERENCES

ERM. 2012. *Wetland Restoration and Creation Plant; Iron Horse Park Superfund Site Operable Unit 3, Billerica Massachusetts*.

Massachusetts Invasive Plant Advisory Group. 2005. *The Evaluation of Non-Native Plant Species for Invasiveness in Massachusetts (with annotated list)*. Available online at https://www.massnrc.org/mipag/docs/MIPAG_FINDINGS_FINAL_042005.pdf. Accessed October 2019.

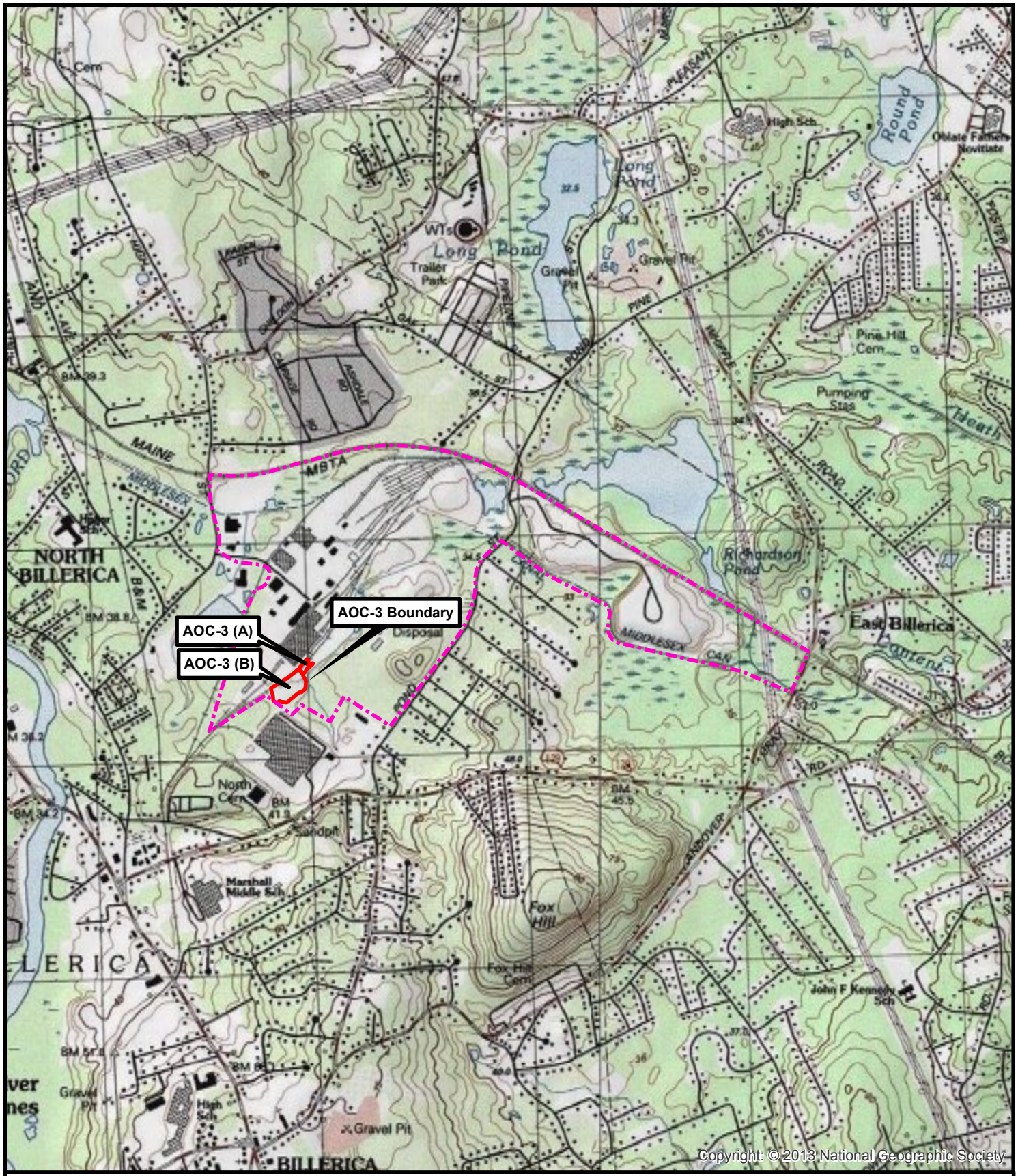
U.S. Army Corps of Engineers (USACE). 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (version 2.0), ed. J. S. Wakeley, R. W. Lichvar, C. V. Noble, and J. F. Berkowitz. ERDC/EL TR-12-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

U.S. Army Corps of Engineers (USACE). 2016. *State of Massachusetts 2016 Wetland Plant List*. Available online at: http://wetland-plants.usace.army.mil/nwpl_static/data/DOC/lists_2016/States/pdf /MA_2016v1.pdf. Accessed October 2019.

U.S. Environmental Protection Agency (USEPA). 2018. *Fifth Five-Year Review Report For Iron Horse Park Superfund Site Operable Units 1, 2, 3, and 4. North Billerica, Massachusetts*. Available online at: https://semspub.epa.gov/work/01/625446.pdf. Accessed October 2019.

U.S. Department of Agriculture, Natural Resource Conservation Science. 2019. *The PLANTS Database*. National Plant Data Team, Greensboro, NC 27401-4901 USA. Available online at: http://plants.usda.gov. Accessed 1 November 2019.

APPENDIX A FIGURES



Legend

- Iron Horse Park Site Boundary
- AOC-3 Boundary

N

0 0.1 0.2 0.3 0.4 0.5 0.6 Miles

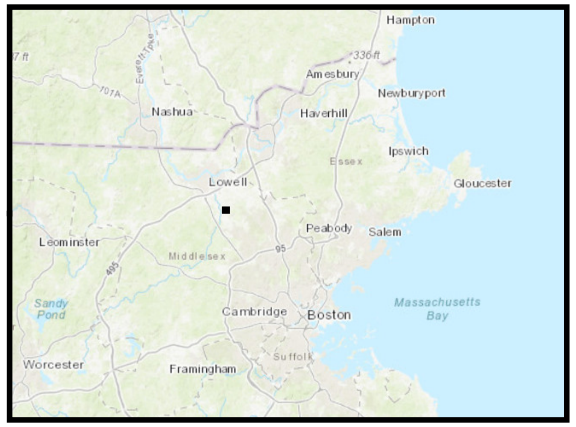
1:24,000

SOURCES:
USGS Topographic Quad Images (December 1995, June 2001) provided by ESRI ArcGIS Online and data partners including USGS and © 2007 National Geographic Society

Figure 1 - Site Locus Map
Iron Horse Park Superfund Site
Billerica, Massachusetts

ERM

Q:\Team\DMV\Clients_L_P\Panam\Iron Horse Park\MXD\2019_10_AOC3_Report\AOC3_SiteLocus_20191022.mxd - nathan.roberts - 10/29/2019



Legend

- Photo Stations
- Long Term Wetland Sample Plots
- Palustrine Forested Wetland (PFO)
- Palustrine Emergent Wetland (PEM)
- Palustrine Scrub Shrub (PSS)
- AOC-3 Boundary

NOTES:
1. Aerial Imagery: Google Earth Imagery from 6/22/2019

N

0 25 50 100 150 200
Feet

Figure 2 - Wetland Monitoring
Iron Horse Park Superfund Site
Billerica, Massachusetts
October 2019

ERM

Q:\Team\DMM\V\Clients_L_P\Panam\Iron Horse Park\MXD\2019_10_AOC3_Report\AOC3_WetlandMonitoring_20191030.mxd - nathan.roberts - 10/30/2019

APPENDIX B PHOTOGRAPHIC LOG

Photo Station 1 Facing East

Photo Station 1 Facing Southeast

Late Summer Wetland Monitoring Site Photographs
Monitoring Years 2019

Photo Station 2 Facing North

Photo Station 2 Facing East

Late Summer Wetland Monitoring Site Photographs

Monitoring Years 2019

Photo Station 2 Facing South

Photo Station 3 Facing East

Late Summer Wetland Monitoring Site Photographs

Monitoring Years 2019

Photo Station 3 Facing Southeast

Photo Station 3 Facing Southwest

Photo Station 4 Facing East

Photo Station 5 Facing Northeast

Photo Station 5 Facing East

Photo Station 5 Facing Southeast

Photo Station 6 Facing North

Photo Station 6 Facing South

Photo Station 6 Facing West

Photo Station 7 Facing Southwest

Late Summer Wetland Monitoring Site Photographs

Monitoring Years 2019

Photo Station 7 Facing West

ERM has over 160 offices across the following countries and territories worldwide

Argentina
Australia
Belgium
Brazil
Canada
Chile
China
Colombia
France
Germany
Ghana
Guyana
Hong Kong
India
Indonesia
Ireland
Italy
Japan
Kazakhstan
Kenya
Malaysia
Mexico
Mozambique
Myanmar
The Netherlands
New Zealand
Norway
Panama
Peru
Poland
Portugal
Puerto Rico
Romania
Russia
Senegal
Singapore
South Africa
South Korea
Spain
Sweden
Switzerland
Taiwan
Tanzania
Thailand
UAE
UK
US
Vietnam

ERM's Boston Office
One Beacon Street, 5th Floor
Boston, MA
02108

T: +1 617 646 7800
F: +1 617 267 6447

www.erm.com

The business of sustainability

ERM